REMARKS

As a preliminary, Applicant and Applicant's representative thank the Examiner for the interview of November 4, 2009.

By the present amendment, claims 1 and 9 have been amended to clarify that an outlet of the oxidation catalyst-forming means feeds into an inlet of the depollution means in the exhaust line.

Support for the added recitations is found in the original application, for example, at least on page 5, lines 12-15.

Further, claim 1 has been amended to replace "to control the engine in a first operating mode… or in a second operating mode…" by "for controlling the engine (i) in a first operating mode… and (ii) in a second operating mode…" for clarity.

Also, in claim 1, "the depollution device" has been replaced by "the depollution means" for antecedent basis, and in claims 17 and 18, "cerine" has been corrected to "ceria."

New claims 19 and 20 dependent on claims 1 and 9, respectively, have been added to recite that, in the second regeneration operating mode the alternating stages of rich mixture operation and of lean mixture operation include at least a first stage of rich mixture operation, followed by a second stage of lean mixture operation, followed by a third stage of rich mixture operation, wherein the rich mixture operation stages have approximately a same duration.

Support for the added recitations is found in the original application, for example, at least on Fig. 2 and corresponding description.

Claims 1-20 are pending in the present application. Claims 1 and 9 are the only independent claims.

I. Objection

In the Office Action, claims 17-18 are objected to as reciting "cerine" instead of "ceria."

Claims 17 and 18 have been amended to change "cerine" to "ceria." Accordingly, it is submitted that the objection should be withdrawn.

II. Art rejections

In the Office Action, claims 1-4, 6-12, and 14-18 are rejected under 35 U.S.C. 102(e) as anticipated by US 6,490,857 to Sasaki ("Sasaki").

Further, claims 5 and 13 are rejected under 35 U.S.C. 103(a) as obvious over Sasaki in view of US 4,655,037 to Rao ("Rao").

Reconsideration and withdrawal of the rejections is respectfully requested.

In Sasaki, the catalytic layer is on the walls of the particle filter channels. This raises the issue that the trapped particulates form a coating on the OSC layer, so that this layer cannot be as efficient when the DPF is clogged, i.e., when there is the most need for this layer.

In addition, Sasaki fails to teach or suggest regeneration stages as in the presently claimed invention.

Specifically, in the first operating mode of Sasaki (illustrated at Fig. 6A), priority is given to low fuel consumption, so that it corresponds basically to a standard mode (see Sasaki at col. 11, lines 52-53). This first operating mode is not used when the particulate filter needs to be regenerated (see Sasaki at col. 11, lines 61-65).

When regeneration is required, Sasaki turns on the second operating mode (illustrated at Fig. 6B). This second operating mode is divided into three engine load operating areas B1, B2 and B3.

In the low engine load area B1 and high engine load area B3, the engine operates similarly to the first operating mode of Sasaki (see Sasaki at col. 12, lines 19-20 and 44-45).

In the high engine load area B3, Sasaki probably considers that, if the load is high enough, the exhaust gas temperature is essentially high enough to burn the trapped particulates, so no additional measure is required.

In the low engine load area B1, Sasaki provides that the air-fuel ratio can be made rich so as to increase the particle filter temperature and release oxygen to improve regeneration (see Sasaki at col. 12, lines 23-24).

Further, in the middle engine load area B2 of Sasaki, the injection phase is delayed and lengthened with sub fuel injections (see Sasaki at col. 12, lines 32-33), so that part of the injected fuel is not burned in the combustion chamber.

However, even though the air/fuel ratio may be changed and shifted toward the rich mode during the second operating mode of Sasaki, there is no disclosure or suggestion in Sasaki of a regeneration mode with alternating phase of rich and lean modes.

Thus, for example, if the load is too low, especially in engine load areas B1 and B2, the exhaust gas temperature may be so low that the sub injections of Sasaki would not provide the required temperature increase, which leads to additional fuel consumption without improved regeneration, i.e., a degradation of fuel economy.

In contrast, in the presently claimed invention, as recited in present claims 1 and 9, the running conditions of the vehicle are analyzed and compared with predetermined threshold values, and the engine is controlled accordingly:

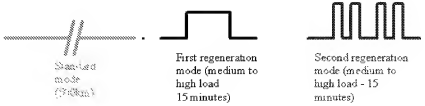
(i) in a first regeneration operating mode by molecular O_2 combustion of the soot with a lean mixture when running conditions are above the threshold values, or

(ii) in a second regeneration operating mode by molecular O_2 combustion of the soot implementing sequences in which engine operation alternates between stages of rich mixture operation and of lean mixture operation when conditions are below the threshold values.

In other words, the engine functions according to at least three operating modes:

- a standard combustion (typically lean, no post-injection necessary),
- a first regeneration mode (typically lean but additional fuel may be provided, for example, via post-injection, i.e., injections occurring after the main injection and during the expansion phase of the piston),
- a second regeneration mode (alternating rich and lean stages).

These operating modes of the presently claimed invention can be exemplified and illustrated as follows:



In particular, in the second regeneration mode, the injection is carried out in such a way that the air/fuel ratio is rich (more fuel than the air can burn), and rich and lean stages are alternating as recited in present claims 1 and 9.

This mode is typically carried out when the first regeneration mode should not be used, for example, when the engine is in low load mode, such as a typical situation when the vehicle is driven in a "purely urban" setting.

An advantage of the presently claimed invention is that it is possible (1) to perform regeneration with lean mode in favorable operating conditions of the engine, and (2) to improve control of the exhaust gas temperature while limiting the rich mode to alternating periods during unfavorable operating conditions of the engine.

Such punctual heating in unfavorable conditions in turn makes it possible to promote lean mode regeneration, as explained and illustrated at page 5, lines 24-27 and page 6, lines 23-27 and as shown on Fig. 2.

The features of the presently claimed invention and their advantages are not taught or suggested in Sasaki, and the other cited reference fails to remedy the deficiencies of Sasaki. Therefore, the present claims are not obvious over the cited references taken alone or in any combination.

Further, with respect to the dependent claims, it is submitted that Sasaki fails to teach or suggest the combined features of each of these claims.

In particular, with respect to claims 19 and 20, it is submitted that Sasaki is completely silent regarding alternating stages of rich mixture operation and of lean mixture operation that

include at least a first stage of rich mixture operation, followed by a second stage of lean mixture operation, followed by a third stage of rich mixture operation, wherein the rich mixture operation stages have approximately a same duration. More specifically, Sasaki relies only on setting a rich mode with sub injections in determined conditions of engine load area B1 or B2, or setting a lean mode in other determined conditions of engine load areas, until regeneration is performed, or until engine load changes to a different area. Thus, Sasaki does not allow minimization of rich mode utilization during phases B1 or B2.

In contrast, an advantage of the feature of claims 19 and 20 is that the alternating periods for the second operating mode, with rich mode operation stages of approximately a same duration interspaced by a lean mode operation stage, make it possible to optimize in a simple manner both a boost to regeneration in unfavourable conditions and a promotion of lean mode utilization in such conditions, as illustrated on Fig. 2.

Further, the other cited reference fails to remedy the deficiencies of Sasaki.

Therefore, each of the respective dependent claims, and in particular, each of claims 19 and 20, is not obvious over the cited references taken alone or in any combination.

In view of the above, it is submitted that the rejections should be withdrawn.

Conclusion

In the event there is, in the Examiner's opinion, any outstanding issue and such issue may be resolved by means of a telephone interview, the Examiner is respectfully requested to contact the undersigned attorney at the telephone number listed below.

In the event this paper is not considered to be timely filed, the Applicants hereby petition for an appropriate extension of the response period. Please charge the fee for such extension and any other fees which may be required to our Deposit Account No. 502759.

Respectfully submitted,

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